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The instant invention concerns a transport and/or a storage device for workpieces in accordance with the preamble of Claim 1 and a transfer system for workpieces.

Such transportation and/or storage devices for workpieces find preferred application as transfer means to more-or-triangular transport of workpieces, for example to sheet metal parts between various processing stations of press plants, like majority transfer presses or Transferpressen.

With such transportation procedures wide sheet metal shaped parts and boards must forwards, between and transported after which single reforming processes become. From DE 44 08 449 A1 and DE 41 04 810 A1 are transportation and/or storage devices for workpieces known, which by means of transverse to the workpiece transportation direction located cross beams, which with corresponding holding means (for example Saugertooling) equipped is, a workpiece transport. The cross beams are at their ends with support rails or also on support rails current carriage connected, whereby the movable of the cross beams in workpiece transportation direction becomes achieved. Simultaneous ones can become the support rails elevated and lowered, in order to ensure a taking up or a deposition of the workpieces which can be transported.

The cross beam is besides pivotable disposed around their longitudinal axis, in order to realize different angles of inclination of the workpieces between receptacle and tray.

A made drive of the cross beams, which are over the support rails or connected with one another over coupling ranging between the carriages current on the support rails, with central disposed cam gears.

With the fact it is adverse that the central disposed curve drives must move large masses, whereby an high driving power becomes required. Besides the suggested transportation and/or storage devices are due to a rigid clutch of the stages among themselves inflexible.

Further 196 54 475 A1 are transfer means known from DE, whereby a cross beam disposed transverse to the transport direction becomes guided by means of two support units. The support units exhibit at least in each case two Führungsschlitten, whereby each Führungsschlitten along a separate vertical disposed guide rail displaceable disposed is. Führungsschlitten of the support unit in each case connected are over tie bars with a joint unit, whereby the joint units of the support units take up an end of the cross beam in each case. One Führungsschlitten of the support units is over steering wheel seaweeds with the joint unit in a separate connecting point a connected, whereby a parallelogram guidance of the cross beam becomes formed. A pivotal movement of the cross beam becomes possible, as the steering wheel seaweeds instead of with one both Führungsschlitten with an other, along a separate vertical guide rail displaceable Führungsschlitten connected is.

With the fact it is adverse that the carriages of the support unit are displaceable disposed along separate guide rails in each case and that a Schwenkbarkeit of the cross beam becomes only possible by the use of an additional carriage, which is more displaceable over an additional driving device along an additional guide rail. Further it is adverse that the guide rails are exclusive vertical disposed.

The invention is the basis the object to create transport and/or storage device which exhibit a small number on in the grip disposed mechanical components, whereby a driving power can become minimized.

Transport and/or storage device according to invention should be adaptable to changed courses of motion preferably in a simple manner. This high flexibility should besides inexpensive be more achievable.

This object becomes according to invention during a transport and/or a storage device for workpieces of the aforementioned type by the features of the claims 1 or 3 dissolved.

Transport and/or storage device according to invention for workpieces exhibit therefore at least a cross beam. For holding a workpiece holding means are disposed at the cross beam. This cross beam is stored by means of several support units, which are displaceable disposed along guide means. The cross beam is at least in a direction parallel more displaceable to the guide means. Each of the support units exhibits at least prolonged-variable supporting means, whereby the cross beam essentially is more pivotable around to longitudinal axis the cross beam parallel axe D.

The prolonged-variable supporting means can exhibit thereby for example an adjustment drive or an electric telescope drive or pneumatic or an hydraulic cylinder.

In one advantageous embodiment particularly exhibits each support unit several Führungsschlitten, whereby Führungsschlitten a support unit along a common, essentially rectilinear guide means disposed are in each case and Führungsschlitten besides are independently more displaceable. These guide means are preferred rectilinear performed.

The single guide rails of the support units are besides favourable-prove parallel to each other and in one to a longitudinal direction of the cross beam of normal direction and horizontal disposed.

A transport direction of a workpiece corresponds, for example within a press plant to the direction of the guide rails. Thus the cross beam is disposed transverse to the workpiece transportation direction.

Each of the support units exhibits a bracket, is at least partial received in which the cross beam. Führungsschlitten of a support unit connected are with the bracket of this support unit in each case by single connection means. Thereby it is favourable if these connection means are performed as ranging members, which are preferably articulated connected with the corresponding brackets by means of hinge joints. In this arrangement these connecting members exclusive work as course and print bars. In a preferred embodiment the single connection means of a support unit with the bracket of this support unit in a common hinge point are articulated connected.

The prolonged-variable supporting means of the single support units are between one Führungsschlitten of a support unit and the bracket of this support unit the formed and connected at separate hinge points with these components. Besides the prolonged-variable supporting means are parallel to between this Führungsschlitten and this bracket formed connection means disposed.

By means of the connection means a misalignment becomes Führungsschlitten mediated along the guide means to the corresponding brackets of the support units, is at least partial received in which the bracket, whereby at least one is Führungsschlitten each support unit with a single drive unit connected. These drive units Führungsschlitten are in each case disposed between a guide formed in the Führungsschlitten and a guide strip of the corresponding guide means received therein.

The single drive units Führungsschlitten are preferred as linear drives with servomotor or hydraulic drives or servo-hydraulic drives or linear motors of the performed.

Over the controller connected with these drive units Führungsschlitten an extent of the misalignment Führungsschlitten along the guide means controlled and thus also the cross beam in a vertical movement and/or an horizontal movement of the displaced becomes.

A pivotal movement of the cross beam around the common hinge point of the connection means with the brackets becomes independent of this horizontal and/or vertical movement of the cross beam by the prolonged-variable supporting means realized.

Adjusting a length and/or. a length variation of the supporting means, thus a displacement of an adjustment drive or an electric telescope drive or a change of a pneumatic or an hydraulic pressure in a cylinder becomes over a separate controller or controlled over the controller of the driving devices.

In the preferred embodiment the cross beam becomes stored, whereby the respective common hinge points between the connection means and the corresponding brackets on a common, by two support units, essentially disposed effect axle parallel to the longitudinal extension of the cross beam are D disposed.

In order to adapt transport and/or storage device for workpieces to different workpiece geometry and workpiece moulds or other changing parameters of the workpieces, the cross beam is releasable with the single brackets of the support units connected, by means of a Andocksystem with index pins and tensioners. Besides the holding means at a longitudinal support of the cross beam are releasable disposed.

⌘ top

Thus a rapid adaptability of transport and/or storage device is actual changing workpiece parameters ensured. Further transport and/or storage device are adaptable to courses of motion which can be changed due to for example a conversion of production rapid and inexpensive without mechanical engagements.

This applies in particular, since a drive Führungsschlitten and/or the prolonged-variable supporting means over a programmable controller, preferably with a memory means, in which different courses of motion are storable Führungsschlitten, an high adaptability of present transport and/or storage device for workpieces of the possible.

Further a driving power exclusive is to be spent on a preferred horizontal misalignment Führungsschlitten along the horizontal guide means. By the few mechanical components disposed in the force river will thus the driving power minimized and a speed of movement can besides opposite known apparatuses increased become, without decreasing thereby the positioning accuracy.

An other object of the invention a transfer system for workpieces is to be created, which several transport and/or storage devices of the aforementioned type combine into a system.

This other object becomes according to invention with a transfer system for workpieces by the features of the claim 23 dissolved.

The transfer system according to invention for workpieces exhibits therefore several transportation and/or storage devices of the aforementioned type, whereby the transportation and/or storage devices are by means of Führungsschlitten of the single support units the mechanical or electric coupled with one another.

Electric interconnecting is provided thereby preferred over the controller. Other preferred embodiments of the apparatus according to invention and the transfer system according to invention are in the remaining Unteransprüchen indicated.

The invention becomes appended more near explained on the basis embodiments in connection with the associated designs. To these point:

Fig. 1 a perspective view of a transport and/or a storage device for workpieces after a first embodiment in schematic illustration,

Fig. 2 a first side view of transport and/or storage device for workpieces after Fig. 1 in an illustration transverse to

the workpiece transportation direction, and

Fig. 3 a second side view of transport and/or storage device for workpieces after Fig. 1 and Fig. 2 in an illustration along the workpiece transportation direction.

Fig. 1 essentially points a perspective view of a preferred embodiment of transport and/or storage device for workpieces 1 with in vertical and horizontal direction a displaceable and around to longitudinal axis of the cross beam parallel axle D a pivotable cross beam 4.

The cross beam exhibits a longitudinal support 5, is 6 releasable disposed at which a holding means. Over the holding means 6 will for example a board held, in order to insert or take around a transformed workpiece these into a press. Over a corresponding choice of the holding means 6 is the cross beam besides at various workpiece geometry and/or, - form adaptable.

The cross beam becomes by means of several support units 2, 3, those along guide means 7, 8 is more displaceable, held. Each support unit exhibits several Führungsschlitten 21, 22 and 31, 32. Führungsschlitten the 21, 22 and/or. 31, 32 a support unit 2, 3 is independently more displaceable along common guide means 7, 8 in each case.

By the arrangement Führungsschlitten of the 21, 22 and/or. 31, 32 on in each case a common guide rail 7 and/or. 8 independent of one, appended more near explained prolonged-variable supporting means 28, 38, the number at mechanical components and drive units minimized becomes. Thus an high adaptability is to different courses of motion ensured with minimized driving power.

The cross beam 4 is over these support units 2, 3 to the guide means 7, 8 parallel into a direction and (like subsequent still more near explained) over a change of a relative distance between the Führungsschlitten 21, 22 and 31, 32 to the guide means 7, 8 normal in a direction more displaceable.

In Fig. 1 embodiment shown and preferred exhibits transport and/or storage device two support units 2, 3 with in each case two Führungsschlitten 21, 22 and 31, 32, whereby Führungsschlitten 21, 22 and 31, 32 a support unit 2, 3 disposed along common guide means 7, in each case is. The two rectilinear guide rails 7, 8 are parallel thereby to each other and in one to a longitudinal direction of the cross beam 4 normal direction aligned. Besides the guide rails are 7, 8 shown and the preferred disposed horizontal in embodiment.

The support units 2, 3 participate as in in Fig. 1 represented, preferred embodiment below the guide rails 7, 8 and thus above a workpiece-transport-planar disposed. In an other, illustrated embodiment are not the support units 2, 3 disposed rotated around 180 DEG above the guide rails 7, 8 and thus below the workpiece-transport-planar.

Everyone in the represented, preferred embodiment Führungsschlitten shown 21, 22, 31, 32 is connected with own separate driving device. These driving devices (not shown) are crosslinked with one another over a common controller (not shown).

Further is everyone Führungsschlitten 21, of the 22, 31, 32 35 connected with a bracket 23, 33 of the corresponding support unit 2, 3 by means of separate connection means 24, 25, 34. In Fig. 1 represented preferred embodiment are the connection means 24, 25, 34, 35 rod-shaped formed, whereby the connection means are effective as course and print bars.

Besides the single connection means 24, 25, 34, 35 of a support unit 2, 3 are with the corresponding bracket this support unit in a common hinge point 26, 36 articulated connected. The brackets and thus at least partly the cross beam 4 received therein are 26, 36 turningmovable around the respective common hinge point.

The hinge axes of the common hinge points 26, 36 are in the preferred embodiment on a common effect axle D disposed, whereby this effect axle D parallel is to longitudinal axis the cross beam 4 disposed. In Fig. a rotational movement is clarified 2 around the effect axle D by the arrow S.

The rotational movement S is 38 supported over prolonged-variable supporting means 28. Over a length of this prolonged-variable supporting means 28, 38 is an angle of the cross beam 4 to horizontal the fixed. Further an extent of a twist is more controllable over a length variation.

The prolonged-variable supporting means 28, 38 cover in (in Fig. 1) preferred embodiment shown a pneumatic or an hydraulic cylinder. In other, not illustrated embodiments covers the prolonged-variable supporting means 28, 38 an adjustment drive and/or an electric telescope drive.

The respective prolonged-variable supporting means 28, 38 of the single support units 2, 3 are formed thereby in the preferred embodiment shown between one Führungsschlitten of the 21, 31 and the bracket 23, 33 of this support unit 2, 3 and are with this Führungsschlitten and this bracket in each case in a single hinge point 15, 16 connected. Besides the respective prolonged-variable supporting means are 28, 38 essentially parallel to connection means 24, 34 disposed formed between the corresponding Führungsschlitten 21, 31 and the corresponding brackets 23, 33.

As described, an extent of the misalignment becomes Führungsschlitten 21, 22, 31, 32 controlled along the guide rails 7, 8 by means of 32 drive units connected with the Führungsschlitten 21, the 22, 31, by the controller, which is more programmable in the preferred embodiment. Such courses of motion for Führungsschlitten the 21, 22, 31, 32 and/or a corresponding length and/or. one change of the length of the prolonged-variable supporting means 28, 38 are deposited in the described preferred embodiment in a memory means, which is connected with the controller.

Besides an actual position Führungsschlitten of the 21, 22, 31, 32 and/or the length becomes and/or. the length variation of the prolonged-variable supporting means 28, 38 over at least a direct or indirect acting measuring system (not shown) detected. This measuring system with the controller is connected. Over a comparison of the determined actual poetry toning with the deposited target being Führungsschlitten and/or. a deposited length and/or. Length variation of the prolonged-variable supporting means 28, 38 is a control and/or. an adaptation of a course of motion feasible.

The several described transportation and/or storage devices can become a transfer system summarized. Respective

same Führungsschlitten of the transportation and/or storage devices thereby mechanical and/or electrically connected are on different manner. An electric interconnecting can become by means of the controller made in particular.

On the basis exemplary described courses of motion Führungsschlitten of the 21, 22 and 31, 32 and the length variation of the prolonged-variable supporting means 28, 38 now the operation of transport and/or storage device for workpieces is to become 1 more near explained.

The description made thereby on the basis in Fig. 2 shown support unit 2. The courses of motion of the support unit 3 likewise acting on the cross beam correspond to the courses of motion of the support unit 2. In particular the support unit accomplishes 3 synchronous courses of motion to the support unit 2. Therefore in the other without a separate description of the courses of motion for the second support unit 3 one does. However transport and/or bearing device for workpieces are 1 not limited on this embodiment.

In an other embodiment of transport and/or bearing device for workpieces 1 the single support units 2, 3 lead and/or. Führungsschlitten 21, the 22, 31, 32 these support units 2, 3 different movements out, whereby for example in Fig. 1 on the left of disposed support unit 2 a Senkbewegung and in Fig. 1 on the right of disposed support unit 3 a stroke movement to accomplish can. Thus an inclination of the cross beam 4 of a comparable inclined plane becomes more adjustable, related to an horizontal plane. A workpiece can become then along such an inclined plane received or deposited.

In Fig. 1 illustrated embodiment is the cross beam 4 essentially normal disposed to the guide means. Führungsschlitten of the support units if 2, 3 different movements implement, also a displacement of the first support unit can become 2 the cross beam adjusted relative to the second support unit 3. Thus an horizontal inclination of the cross beam becomes 4 possible, whereby thus the cross beam is a bottom angle to normals on the guide means the disposed. Thus a workpiece a bottom adjustable angle can to the transport direction and/or. normals on the guide means the received or deposited become.

From reasons of the simpleness of the description becomes in the following however exclusive on similar, in particular synchronous movement between the single support units 2, 3 respect taken.

In a first example of a course of motion of the support unit 2 become in Fig. 2 on the left of disposed first Führungsschlitten 21 and in Fig. 2 right disposed Führungsschlitten 22 in each case around a distance with the amount X in a direction along the guide rail 7 displaced. A relative distance between first and second Führungsschlitten 21, 22 remains thus constant.

With first and second Führungsschlitten 21, 22 in each case over single connection means 24, 25 connected bracket 4 moved itself thus parallel to the guide rail 7 in a rectilinear movement.

If the guide rail is 7 horizontal disposed, so moved itself accordingly the bracket 23 and thus also therein received the cross beam 4 in a rectilinear movement along the workpiece transportation direction.

As long as a length of the prolonged-variable supporting means 28 unchanged remains, becomes in Fig. 2 parallel alignment shown of the bracket 23 to the guide means 7 maintain.

With a change of the length of the prolonged-variable apparatus 28 a made pivotal movement of the bracket 23 around the common hinge axis 26 and thus around the effect axle D between the connection means 24, 25 between the Führungsschlitten 21, 22 and the bracket 23.

Thus the cross beam knows 4 in any angle at least between the horizontal position 0 DEG corresponding in Fig. 2 arrangement shown and a vertical position 90 DEG pivoted becomes. Accordingly also a workpiece held between an horizontal arrangement and a vertical arrangement can become pivoted.

In a second example of a course of motion first Führungsschlitten 21 becomes 7 displaced around a distance X into a direction along the guide rail. Further second Führungsschlitten 22 becomes 7 displaced around a distance Y along the guide rail.

If the directions of movement first and the second guidance carriage are 21, 22 opposite and the amounts of the distances X and Y equally large in this second example, the bracket 23 and thus the cross beam become 4 in an exclusive vertical direction the guide rail 7 moved. With in Fig. 2 preferred embodiment shown the cross beam 4 vertical raised becomes.

First and second Führungsschlitten 21, 22 however around the same amount X or Y approach one on the other, the bracket becomes 23 and thus the cross beam 4 in an exclusive vertical direction of the guide rail 7 moves away. The bracket 23 and thus the cross beam 4 become lowered.

If the amounts of the distances X and Y are of various sizes, a combined vertical and Horizontalbewegung of the bracket 23 and thus the cross beam 4 result.

Thereby first and second Führungsschlitten 21, 22 approach one on the other, then the bracket 23 in vertical direction is moved away by the guide rail 7 and in horizontal direction the corresponding difference of the amounts X and Y into the direction of the guidance carriage with the smaller amount X or Y moved.

First and second Führungsschlitten 21, 22 move away from each other, the relative distance between first becomes and second Führungsschlitten 21, 22 enlarged. Thus the bracket 23 in vertical direction the guide rail 7 moved and in horizontal direction the corresponding difference of the amounts X and Y becomes into the direction of the guidance carriage with the larger amount X or Y moved.

By a corresponding superposition of the linear movements first and/or the second guidance carriage 21, 22 a superposition becomes the vertical and the horizontal movements of the bracket 23 and thus the cross beam 4 and thus an image of any horizontal and/or. Vertical movement possible. By means of the prolonged-variable supporting means 28 knows besides these horizontal and/or. Vertical movement with a pivotal movement of the cross beam 4

around the common hinge axis 26 and thus around the effect axle D combined become.

Thus a workpiece can become bottom any angle horizontal the received and/or deposited. Besides this pivotal movement is not 4 coupled with the horizontal and/or vertical movement of the cross beam. Accordingly transport and/or storage device can become a corresponding free selectable movement curve controlled.